ANALYSIS OF HISTORICAL CAR PRICE DIFFERENCES BETWEEN CANADA AND THE U.S.

BY

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FOR

Environmental Protection Service
Environment Canada

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EXECUTIVE SUMMARY

This report presents a comparative analysis of car prices in Canada and the U.S. between 1967 and 1982. This work was undertaken in an attempt to assess what, if any, influence changes in vehicle emission standards have had on vehicle price differences between Canada and the U.S. In theory, due to the more lenient emission standards in Canada and thus the simpler control systems required, Canadian vehicles should cost less than their U.S. counterparts. To analyze this hypothesis, a database of prices on representative North American, imported and luxury vehicles was assembled. This database was then used to statistically test for the presence of price differences and the relation the differences have to economic and regulatory (standards) variables.

The study chose the top 10 North American made vehicles as representing the typical North American vehicle while imported vehicles were represented by Nissan, Honda, Toyota, Volkwagen, Renault and Fiat. Luxury cars consisted of Cadillac, Lincoln, Imperial, Cressida and Audi.

The results of the timeseries analysis (Figure A, B and C) indicate that upto 1976 there was a 10-20% price premium for cars in Canada. Between 1977 and 1982, this difference has decreased until there is currently a 5% price advantage on average for the typical North American vehicle. Imported and luxury vehicles still cost more in Canada (2% and 10% respectively) but less than they did at the start of the period.

FIGURE A CAR PRICE DIFFERENCE RATIOS FOR THE 10 TOP NORTH AMERICAN MODELS (AVERAGE)

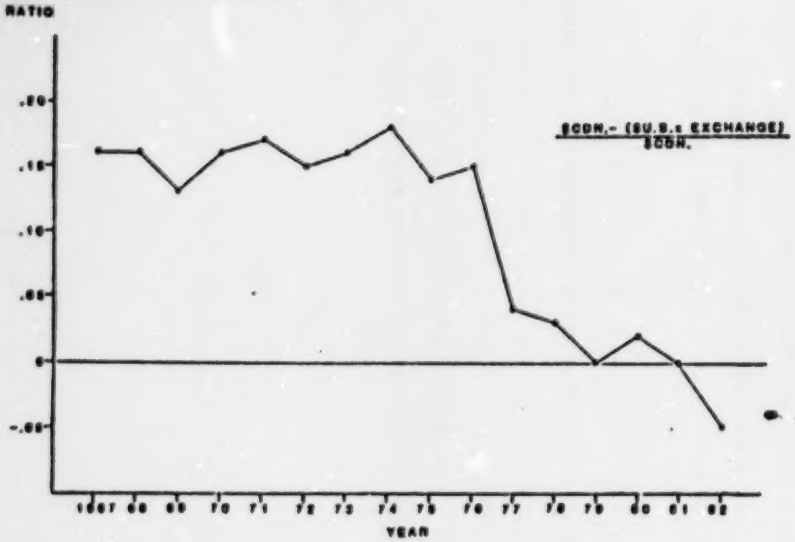


FIGURE B IMPORTED CAR AVERAGE PRICE DIFFERENCE RATIOS

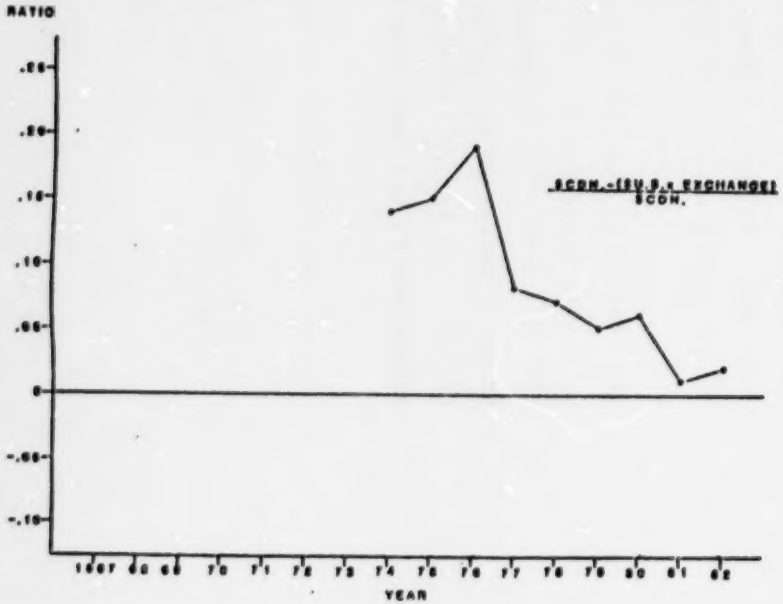
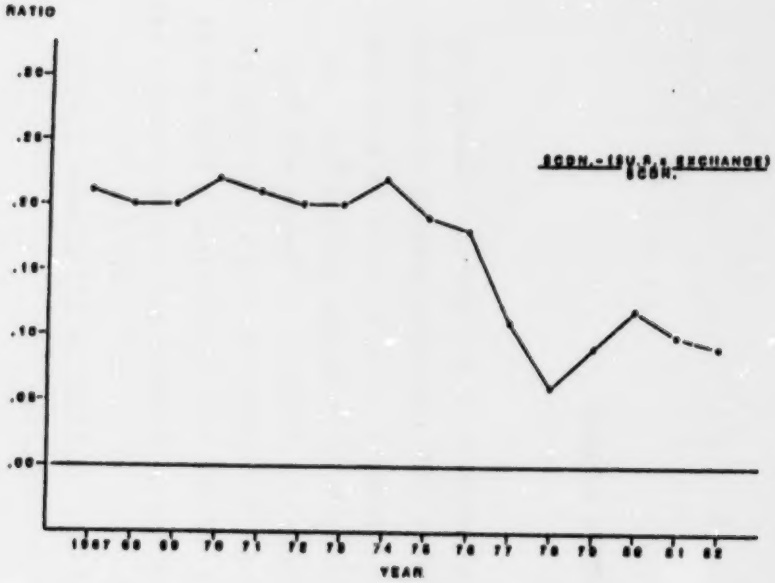


FIGURE C LUXURY CAR PRICE DIFFERENCE RATIOS (AVERAGE)



When regression analysis was undertaken on the price difference data, a strong correlation was found with the relative value of the Canadian dollar to the U.S. dollar and Japanese Yen. No correlation was found with gasoline price or with the manufacturing price index (a measure of vehicle assembly costs).

The 1975 imposition of Canadian emission standards that were less stringent than the U.S. did not statistically effect the price differentials. The further reductions in U.S. standards in 1977, 1980, and 1981 do not correspond to the changes in the price differentials.

The study concludes that the changes in prices between Canada and U.S. are best explained by changes in exchange rates and have little relationship to the other explanatory variables assessed.

RÉSUMÉ À L'INTENTION DE LA DIRECTION:
ANALYSE DES DIFFÉRENCES HISTORIQUES DES PRIX DES VOITURES AU CANADA ET AUX ÉTATS-UNIS

préparé par
James F. Hickling Management Consultants Ltd.

Environnement Canada examine dans le cadre du programme d'analyse des incidences socio-économiques divers moyens de réduire les émissions produites par les automobiles. Une solution serait d'établir des limites d'émission pour les oxydes d'azote (NO_x), les hydrocarbures (HC) et le monoxyde de carbone (CO) qui ne pourraient être atteintes sans utiliser l'essence sans plomb et un convertisseur catalytique trifonctionnel. À l'heure actuelle, la loi canadienne ne prescrit pas l'emploi de tels convertisseurs, mais certaines voitures importées au Canada en sont quand même équipées.

Sont présentés dans ce rapport les résultats d'une analyse des prix canadiens et américains entre 1967 et 1982 des voitures nord-américaines et importées. On a cherché à déterminer s'il existait une différence historique entre le prix des voitures équipées de convertisseurs trifonctionnels et celui des voitures munies de dispositifs dépolluants moins perfectionnés et l'influence possible des modifications des normes d'émission sur les différences de prix des véhicules au Canada et aux États-Unis. Comme au Canada les normes d'émission sont moins sévères et les dispositifs dépolluants plus simples, les véhicules canadiens devraient théoriquement coûter moins cher que les mêmes véhicules aux États-Unis. Pour vérifier cette hypothèse, une base de données sur les prix de véhicules représentatifs nord-américains, importés et de luxe a été constituée. À l'aide de cette base de données, on a ensuite contrôlé statistiquement les différences de prix et la relation entre ces différences et des variables économiques et réglementaires (normes).

Les dix plus importants véhicules fabriqués en Amérique du Nord ont été choisis pour représenter le véhicule nord-américain typique, tandis que les véhicules importés étaient représentés par Nissan, Honda, Toyota, Volkswagen, Renault et Fiat. Les voitures de luxe considérées sont les Cadillac, Lincoln, Imperial, Cressida et Audi. Les principaux facteurs examinés sont:

- le prix des voitures neuves;
- le taux de change;
- l'indice des prix de production des automobiles;
- le prix de détail de l'essence.

Des sources canadiennes et américaines de données ont été consultées.

Les analyses des séries chronologiques ont révélé une nette réduction graduelle du prix relatif des voitures au Canada par rapport aux États-Unis (figures A, B et C). Avant 1977, les voitures coûtaient en moyenne 15 p. 100 de plus au Canada. La différence était de 15 p. 100 dans le cas des voitures nord-américaines ordinaires, un peu plus faible (10 à 15 p. 100) pour les voitures importées (déterminée par les séries chronologiques tronquées) et plus élevée (15 à 20 p. 100) pour les voitures de luxe.

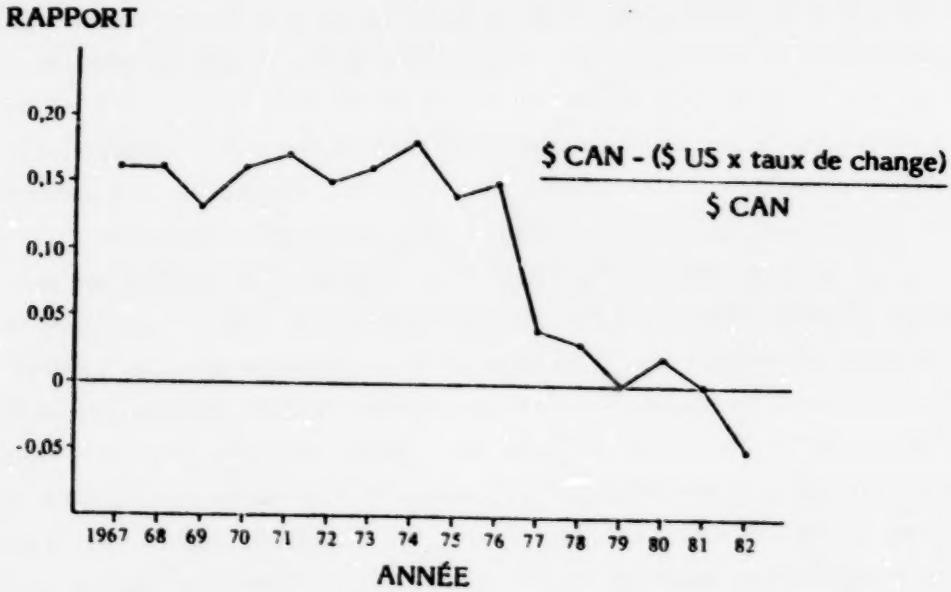


FIGURE A DIFFÉRENCE DES PRIX CANADIENS ET AMÉRICAINS PAR RAPPORT AUX PRIX CANADIENS POUR LES DIX PLUS IMPORTANTS MODÈLES NORD-AMÉRICAINS (moyenne)

Après 1977, les rapports ont changé considérablement, et en 1982 le prix de vente de beaucoup de voitures était plus faible au Canada qu'aux États-Unis. Audi fait notablement exception, ayant maintenu des prix de 25 p. 100 plus élevés au Canada.

Des analyses de régression des prix par rapport à plusieurs variables économiques explicatrices possibles ont été réalisées. Ces variables sont:

- les taux de change (du $ US et du yen);
- le prix relatif de l'essence aux États-Unis;
- l'indice relatif des prix de production aux États-Unis.

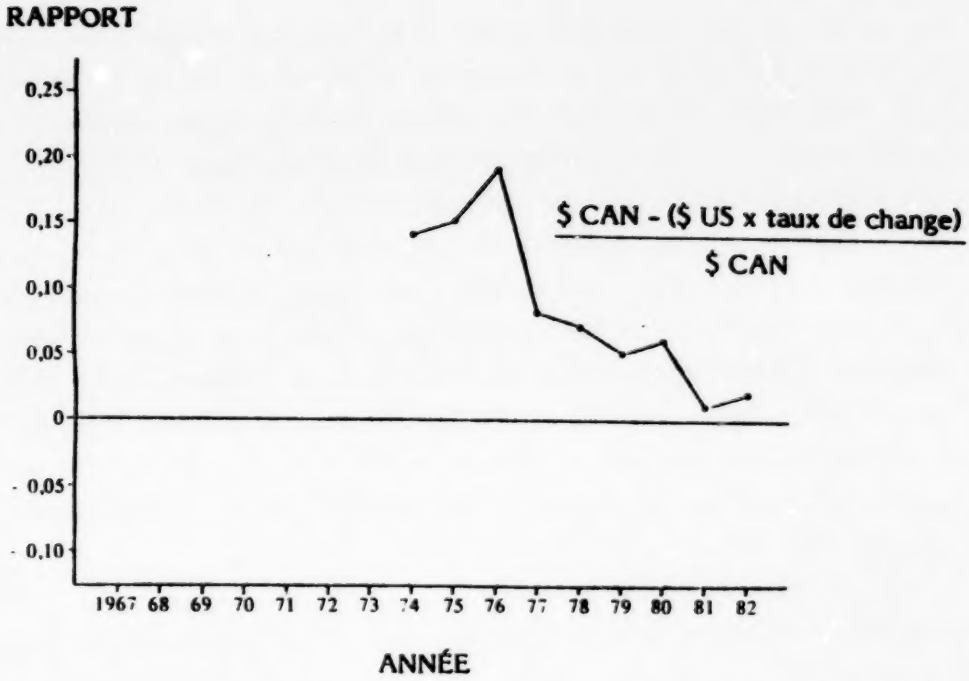


FIGURE B DIFFÉRENCE DES PRIX CANADIENS ET AMÉRICAINS MOYENS DES VOITURES IMPORTÉES PAR RAPPORT AUX PRIX CANADIENS

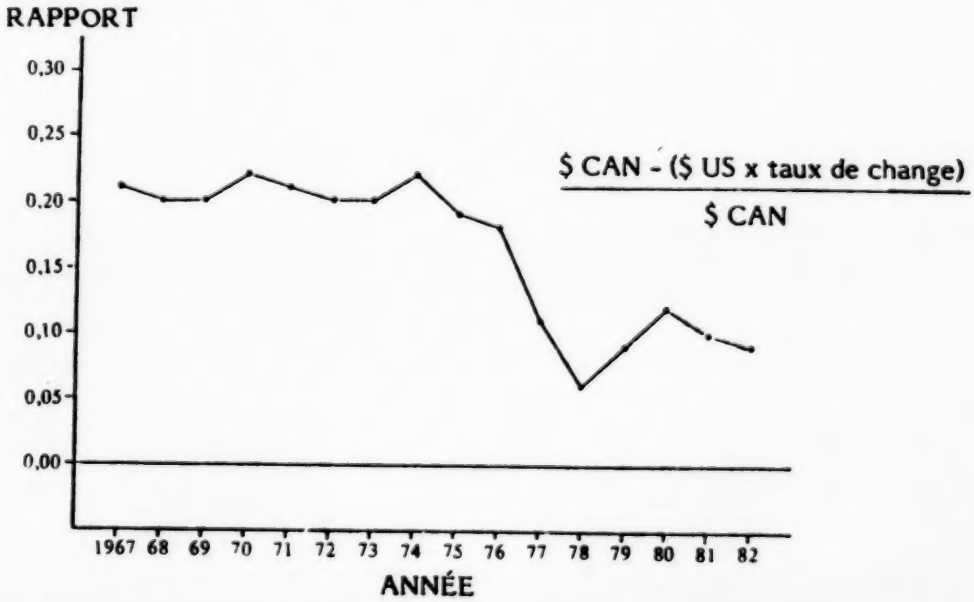


FIGURE C DIFFÉRENCE DES PRIX CANADIENS ET AMÉRICAINS DES VOITURES DE LUXE PAR RAPPORT AUX PRIX CANADIENS (moyenne)

Le seul paramètre pour lequel il y avait une relation prononcée avec les changements de prix est le taux de change. On a observé une corrélation négative entre le cours du dollar US et du yen et les différences des prix, ce qui indique qu'au fur et à mesure que le dollar canadien s'affaiblissait par rapport au dollar US et au yen japonais, le prix des voitures au Canada diminuait par rapport au prix aux États-Unis.

Comme la baisse graduelle des prix canadiens par rapport aux prix américains a commencé en 1977, lorsque s'est produite la première dévaluation importante du dollar canadien, il est évident qu'elle n'est pas reliée à la différence des normes d'émission dans les deux pays. Ces normes ont été un peu plus souples au Canada jusqu'en 1975, année où des normes beaucoup plus sévères ont été adoptées aux États-Unis. Théoriquement, cela aurait dû faire baisser les prix au Canada, mais ce ne fut pas le cas. Les prix sont demeurés stables (15 p. 100 supérieurs au Canada) jusqu'à la dévaluation du dollar canadien en 1977.

On peut donc conclure que:

- la corrélation est élevée entre les taux de change et les variations relatives des prix des voitures; et
- les modifications des normes d'émission n'ont pas influé de façon perceptible sur les différences moyennes des prix au Canada et aux États-Unis.

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1.0 INTRODUCTION

Environment Canada, through its Socio-Economic Impact Assessment (SEIA) program is considering various means by which automotive emissions can be reduced. One option is the establishment of emission standards to control NOx, HC, and CO which could be met only by the use of unleaded gasoline in conjunction with a 3-way catalytic converter. At present, there is no regulatory requirement in Canada for such converters, although certain cars imported into Canada are so equipped.

This report contains the results of an analysis of Canadian and U.S. prices of North American and foreign import cars to determine if there has been a historical price difference between those automobiles equipped with 3-way converters and those with less sophisticated emission control systems.

The terms of reference of the original Environment Canada request for proposal determined the required analytical procedures. These terms are detailed in Appendix B of this report and are briefly summarized below:

- plot Canadian and U.S. prices of selected North American, import and luxury car models for the period 1967-1982;
- plot the exchange rates, the manufacturing price index, and the retail gasoline prices for the same period;
- for each automobile group, calculate bivariate correlation coefficients with the exchange rate, manufacturing price index and the gasoline price.

The results of this automotive pricing analysis are presented in this report as a series of graphs with brief accompanying commentaries. In addition to the the graphical presentation, Appendix A of this report contains tables which represent the basic data that were used to produce these graphs.

2.0 DATA SOURCES

The major data classifications used in this analysis of historical Canada and U.S. car price differences are:

- new car price;
- exchange rate;
- automotive manufacturing price index;
- retail gasoline price.

Both Canadian and U.S. data sources, as described in the subsequent paragraphs, were used to obtain data for the period 1967-1982. This data is summarized in various tables in Appendix A.

2.1 NEW CAR PRICE DATA

New car prices were determined from the following publications:

Canadian Prices:	Sandford Evans Motor Vehicle Data Book Volume 28 (1975), Volume 35 (1982) Supplement (1982)
	Ward Publishing Ltd. Black Book Volume 1982
U.S. Prices:	Wards Automotive Year Book Volumes 1967-1981
	National Auto Research Black Book Volume September 1982

The North American car price analysis required new car sales volume data. This information was obtained from data published by R.L. Polk & Co. Ltd.

In order to establish comparative Canadian and U.S. car prices, an arbitrary "middle of the line" model was chosen for each car make annually. Typically, this model was an 8, 4, or occasionally a 6 cylinder 4-door sedan.

2.2 EXCHANGE RATE DATA

Exchange rates for the U.S. dollar and for the Japaneese Yen were obtained from the Bank of Canada Review monthly publication.

2.3 AUTOMOTIVE MANUFACTURING PRICE INDEX DATA

The motor vehicle manufacturing price indicies were determined from the following publications:

Canadian Index:	Statistics Canada Industry Selling Price Indices Manufacturing Division
U.S. Index:	Statistical Abstract of the United States National Data Book and Guide to Sources Department of Commerce Bureau of the Census

Both the Canadian and the U.S. indices are expressed with the base year 1967 = 100.

2.4 RETAIL GASOLINE PRICE DATA

National average retail gasoline prices were obtained from:

Canadian Prices:	Statistics Canada Informaion and Current Analysis Unit Consumer Price Section Prices Division
U.S. Prices:	Platt's Oil Price Handbook (1967-1973) Monthly Energy Review (1974-1982) Department of Energy

The Canadian prices represent an average annual retail gasoline price for 15 cities. The U.S. retail gasoline prices were determined from 55 representative cities (Platt), while the basis for the DOE average was not indicated in the publication.

3.0 PRICING ANALYSIS

3.1 NORTH AMERICAN PRICE DIFFERENCE RATIOS

The graphs in Figures 1 and 2 show the year-to-year changes in the Canadian car price minus the U.S. car price (incorporating the U.S. dollar exchange rate) divided by the Canadian price. Figure 1 depicts the unweighted average ratios. Figure 2 indicates the sales weighted ratios for the top 10 North American sales models.

FIGURE: 1 CAR PRICE DIFFERENCE RATIOS FOR THE 10 TOP NORTH AMERICAN MODELS (AVERAGE)

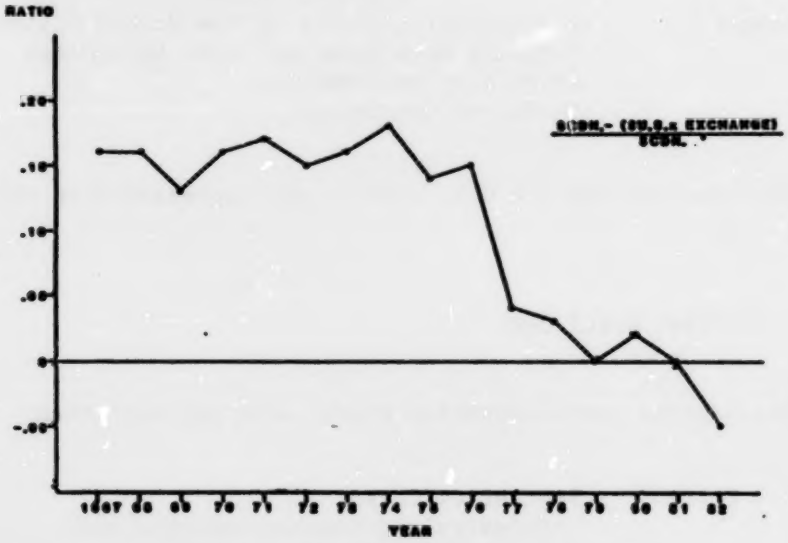
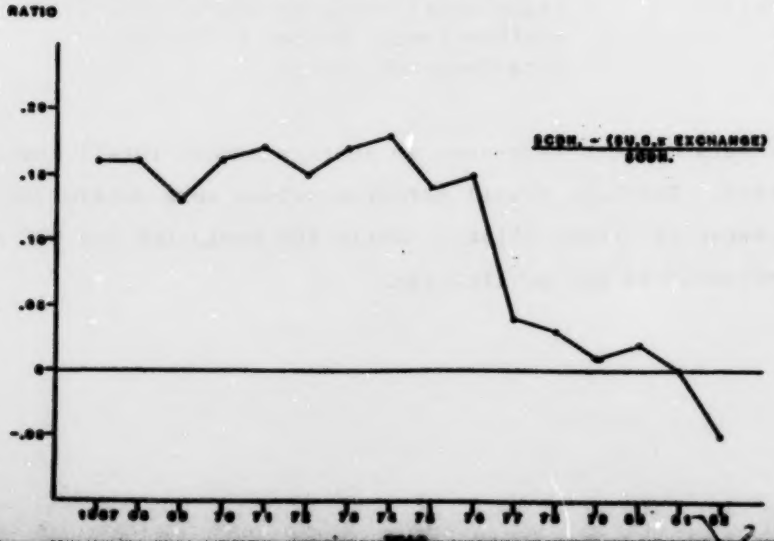


FIGURE: 2 CAR PRICE DIFFERENCE RATIO FOR THE TOP 10 NORTH AMERICAN MODELS (SALES-WEIGHTED)



3.2 IMPORT CAR PRICE DIFFERENCE RATIOS

The graphs in Figures 3, 4, 5, 6, 7, 8 and 9 show the year-to-year changes in the price difference ratios for certain models of the following imported car makes: Nissan, Honda, Toyota, Volkswagen, Renault and Fiat.

The timeseries of data is incomplete because U.S. prices for import makes prior to 1974 were not available for analysis.

FIGURE: 3 IMPORTED CAR AVERAGE PRICE DIFFERENCE RATIOS

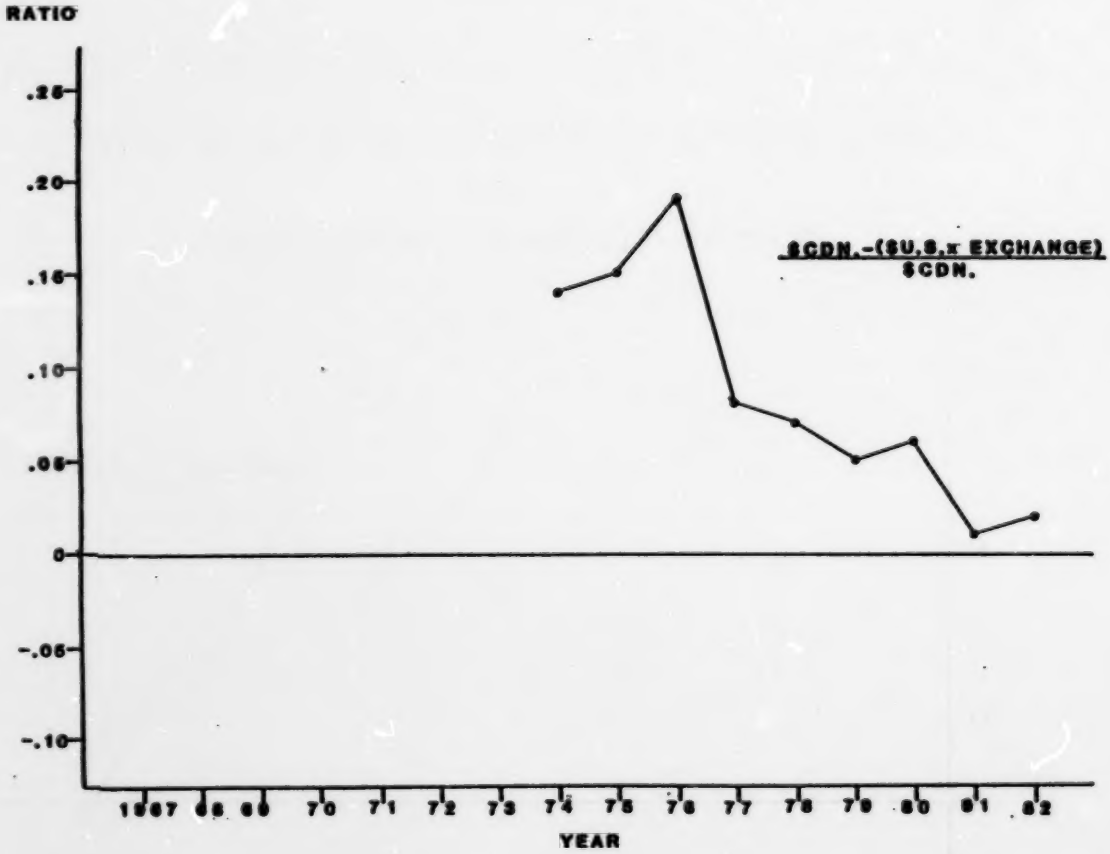


FIGURE: 4 IMPORT PRICE DIFFERENCE RATIOS (NISSAN)

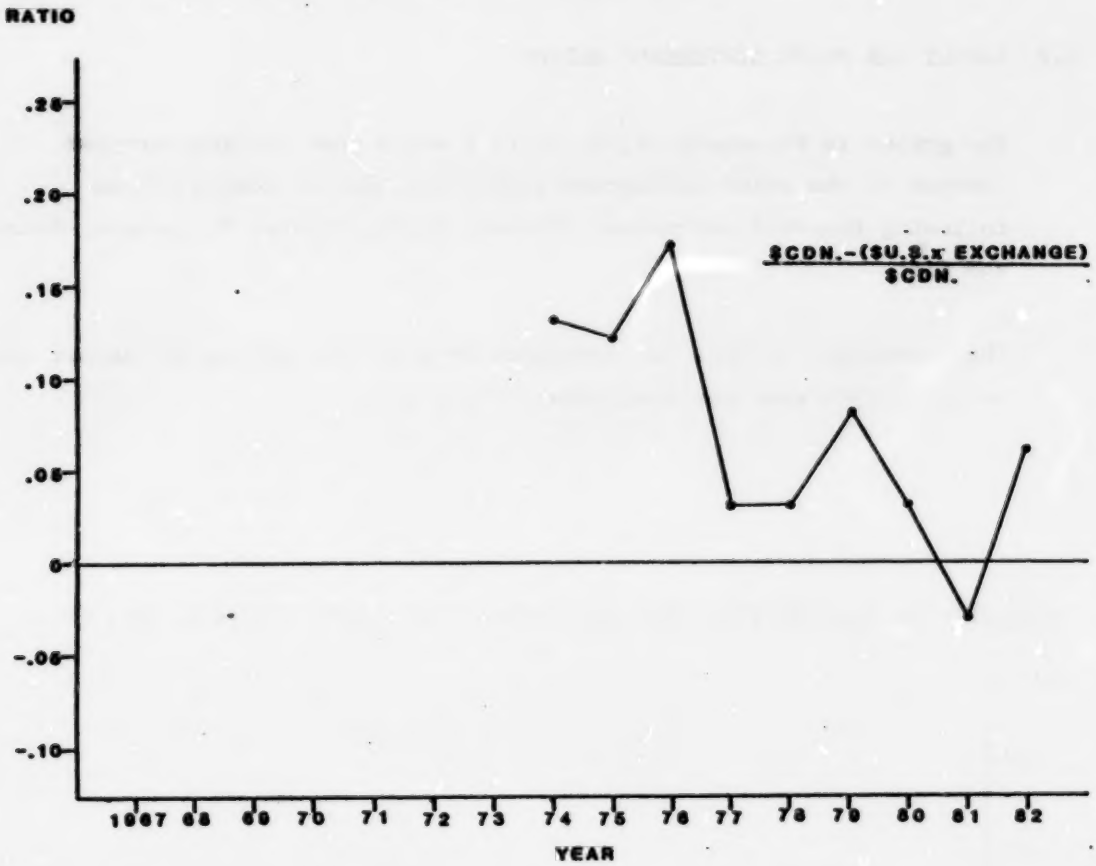


FIGURE: 5 IMPORT PRICE DIFFERENCE RATIOS (HONDA)

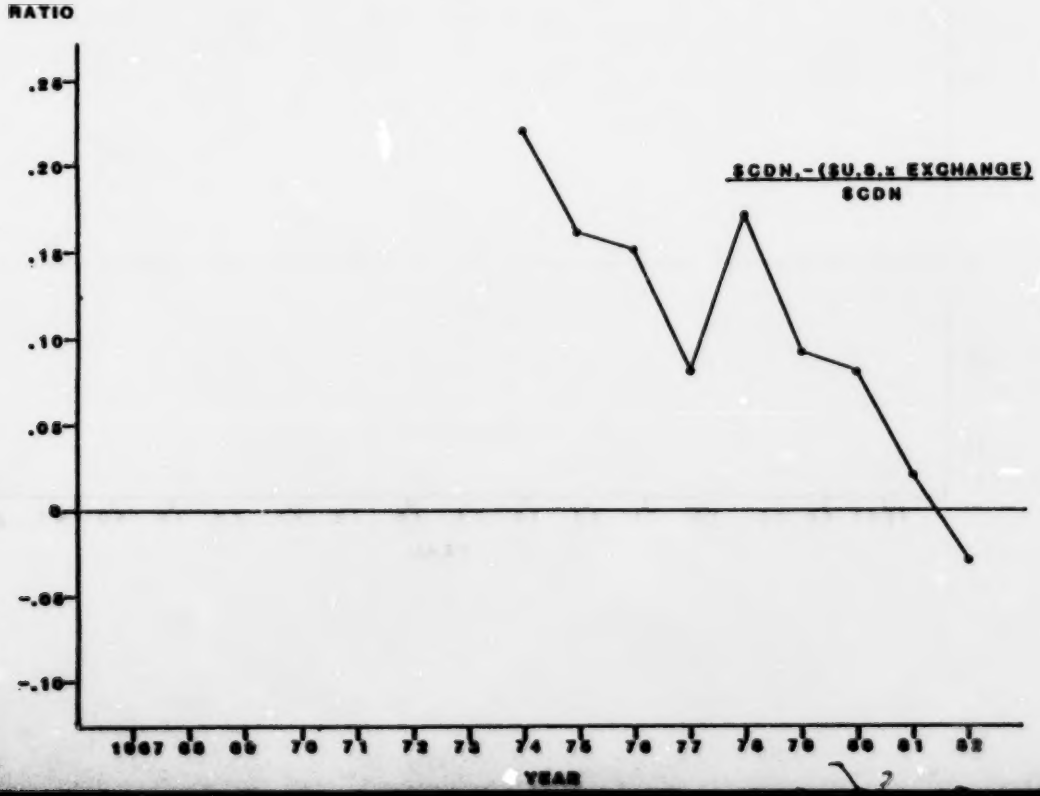


FIGURE: 6 IMPORT PRICE DIFFERENCE RATIOS (TOYOTA)

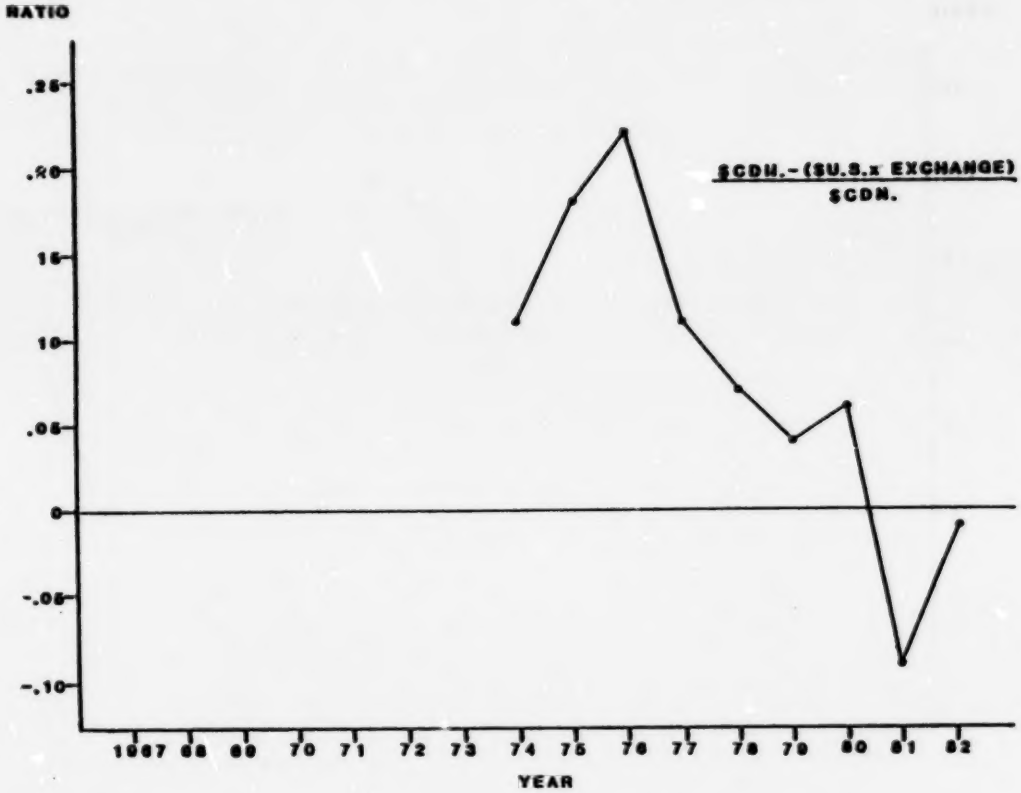


FIGURE: 7 IMPORT PRICE DIFFERENCE RATIOS (VOLKSWAGEN)

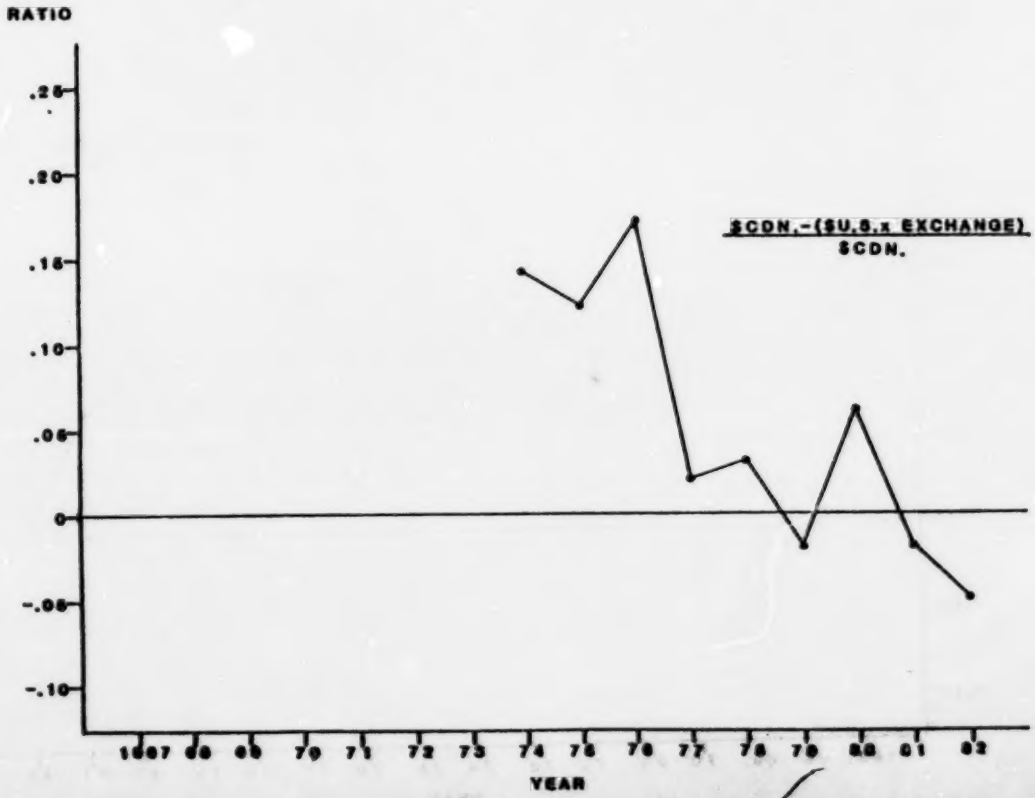


FIGURE: 8 IMPORT PRICE DIFFERENCE RATIOS (RENAULT)

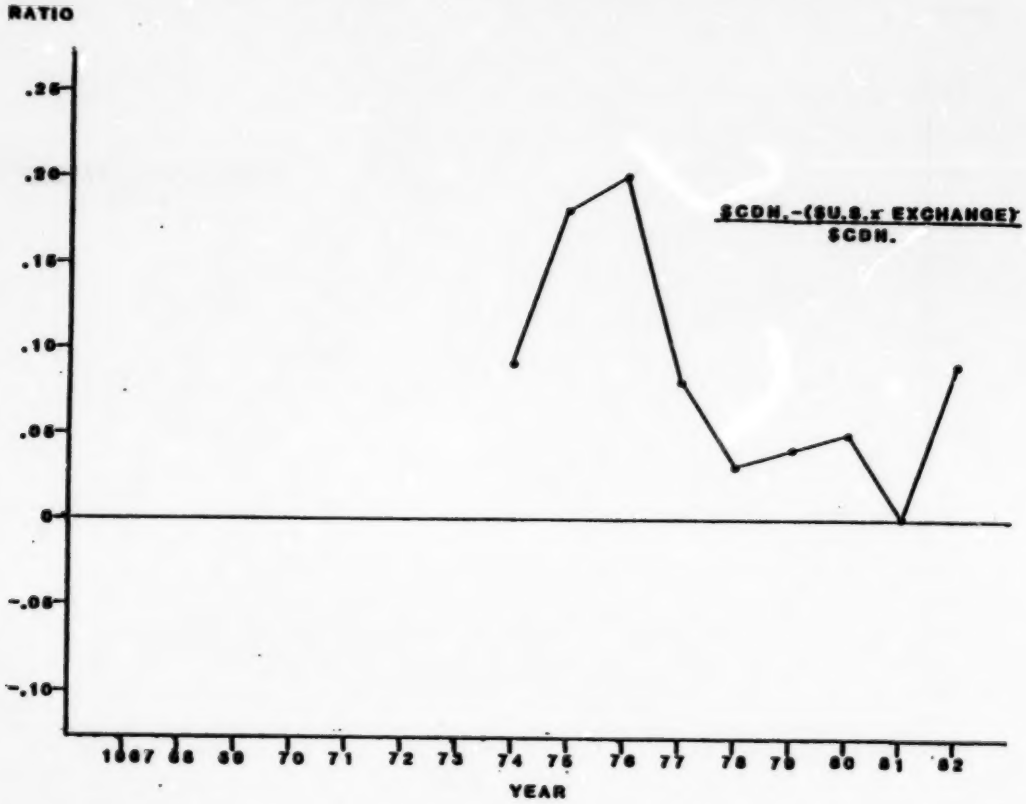
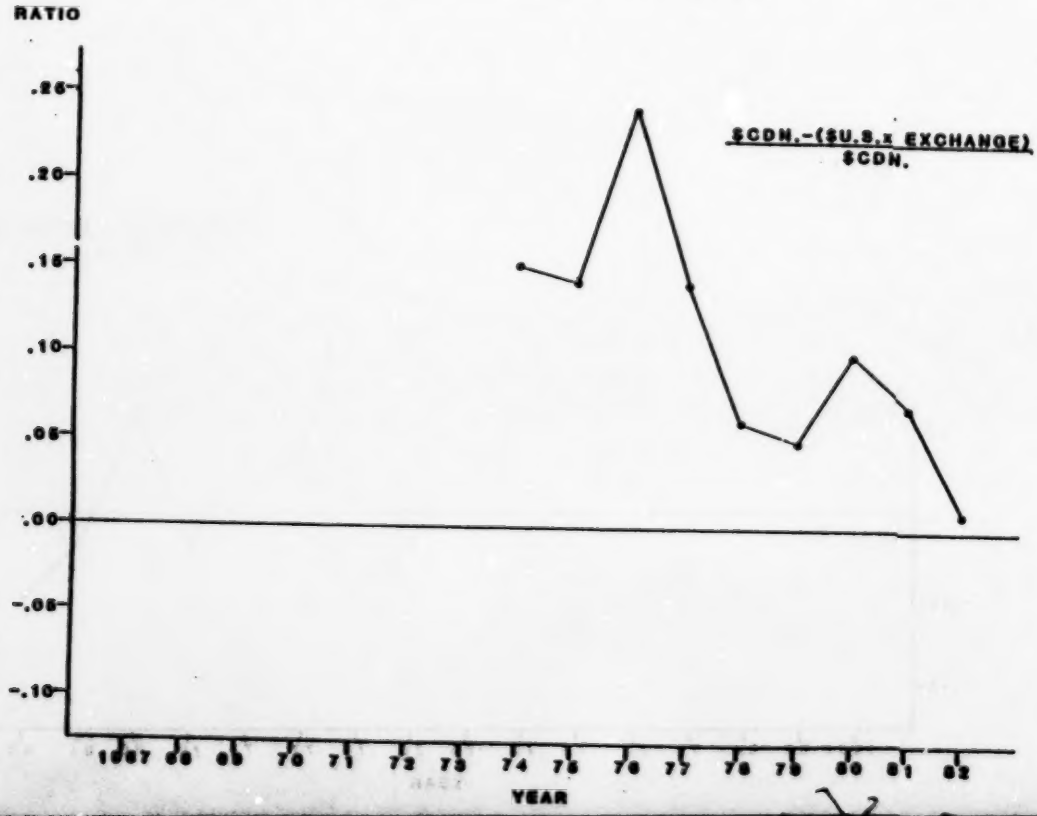


FIGURE: 9 IMPORT PRICE DIFFERENCE RATIOS (FIAT)



3.3 LUXURY PRICE DIFFERENCE RATIOS

The graphs in Figures 10, 11, 12, 13, 14 and 15 show the year-to-year changes in the price difference ratios for certain models of selected luxury car makes: Cadillac, Lincoln, Imperial, Cressida and Audi.

The timeseries of data is incomplete because U.S. prices for import makes prior to 1974 were not available for analysis.

FIGURE: 10 LUXURY CAR PRICE DIFFERENCE RATIOS (AVERAGE)

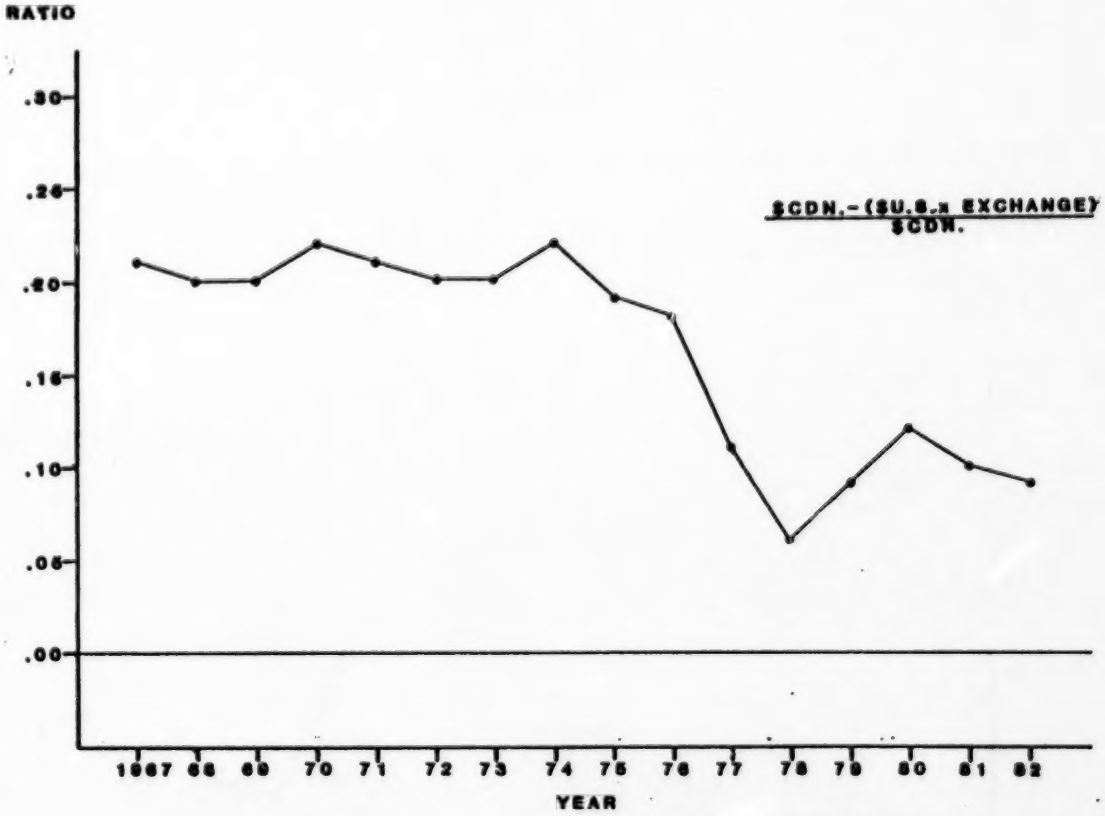


FIGURE: 11 LUXURY CAR PRICE DIFFERENCE RATIOS (CADILLAC)

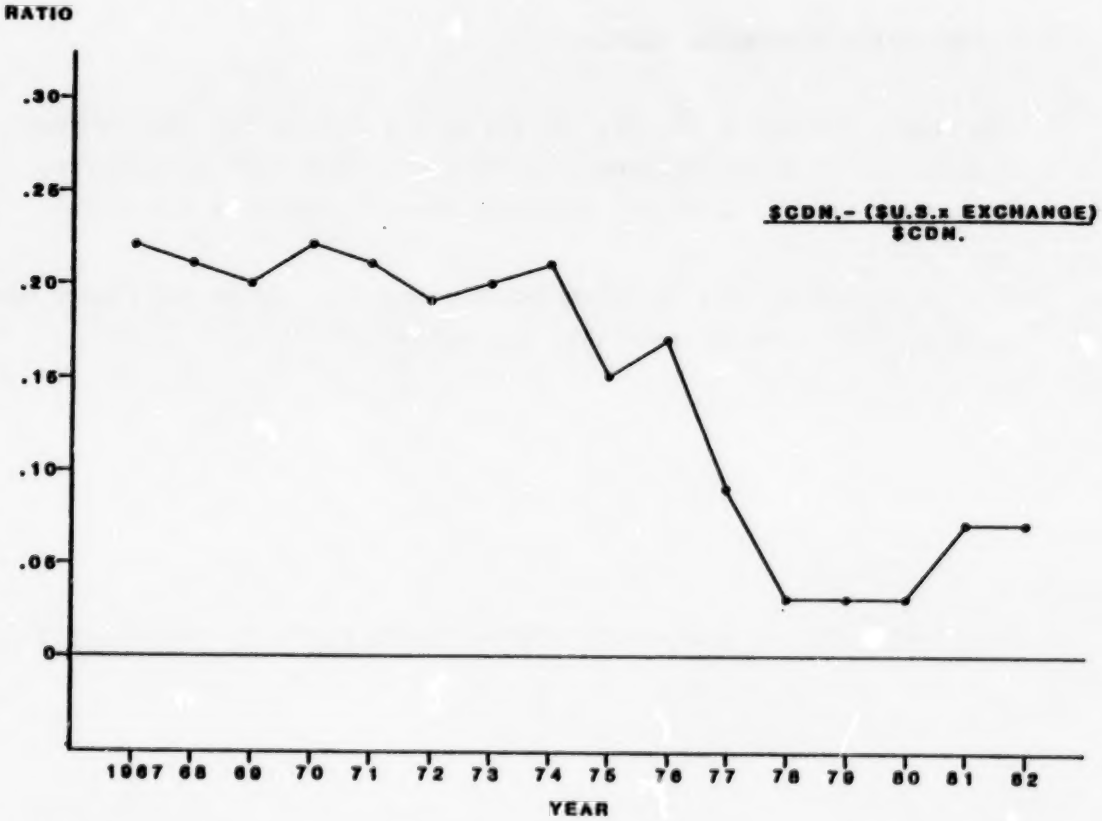


FIGURE: 12 LUXURY CAR PRICE DIFFERENCE RATIOS (LINCOLN)

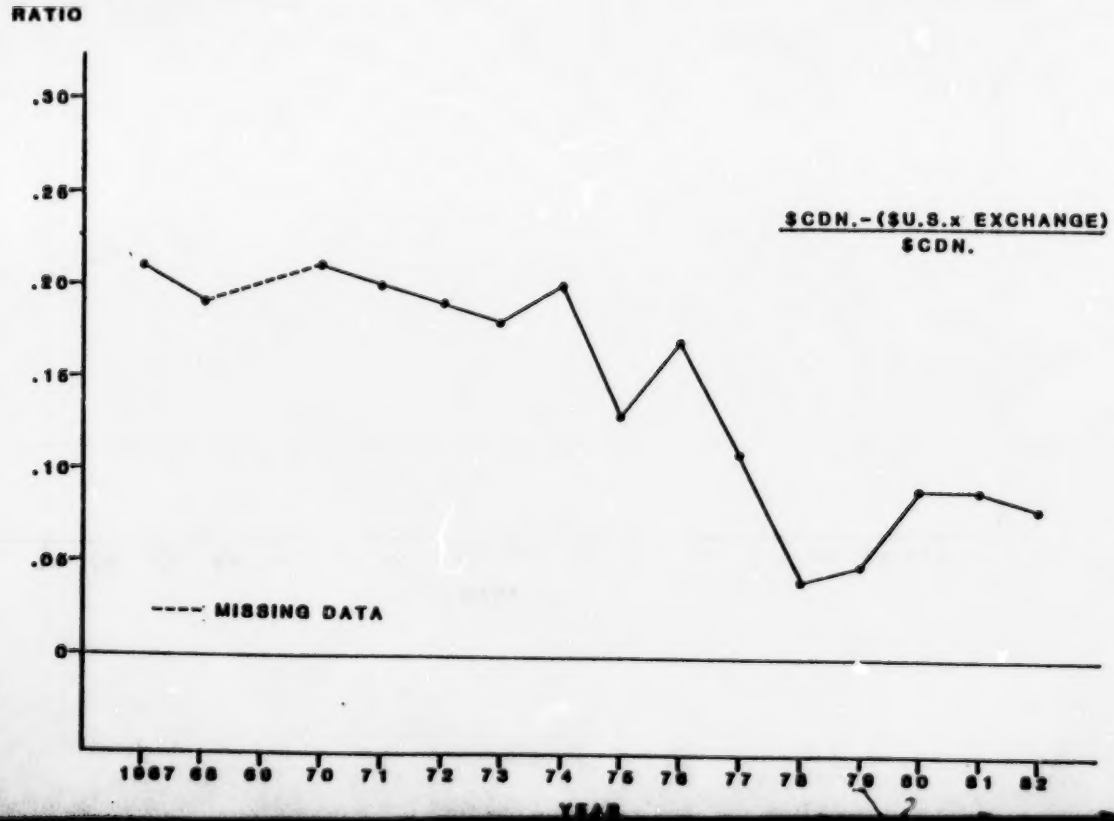


FIGURE: 13 LUXURY CAR PRICE DIFFERENCE RATIOS (IMPERIAL)

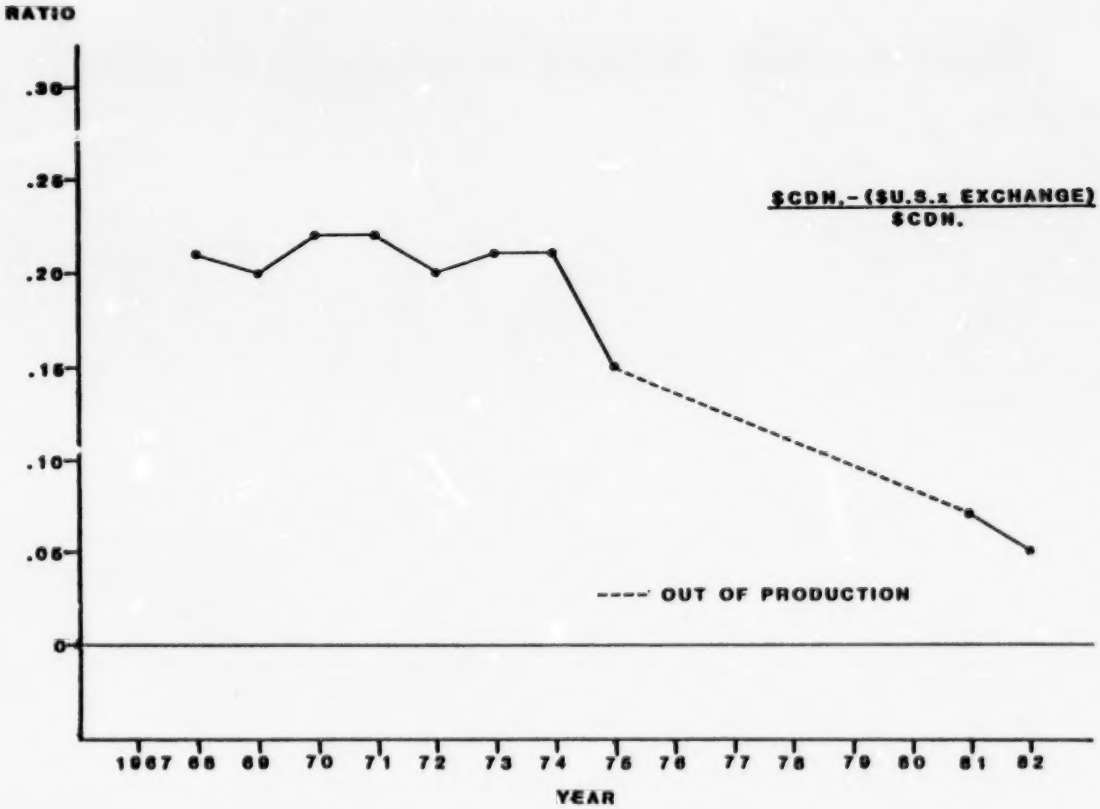


FIGURE: 14 LUXURY CAR PRICE DIFFERENCE RATIOS (CRESSIDA)

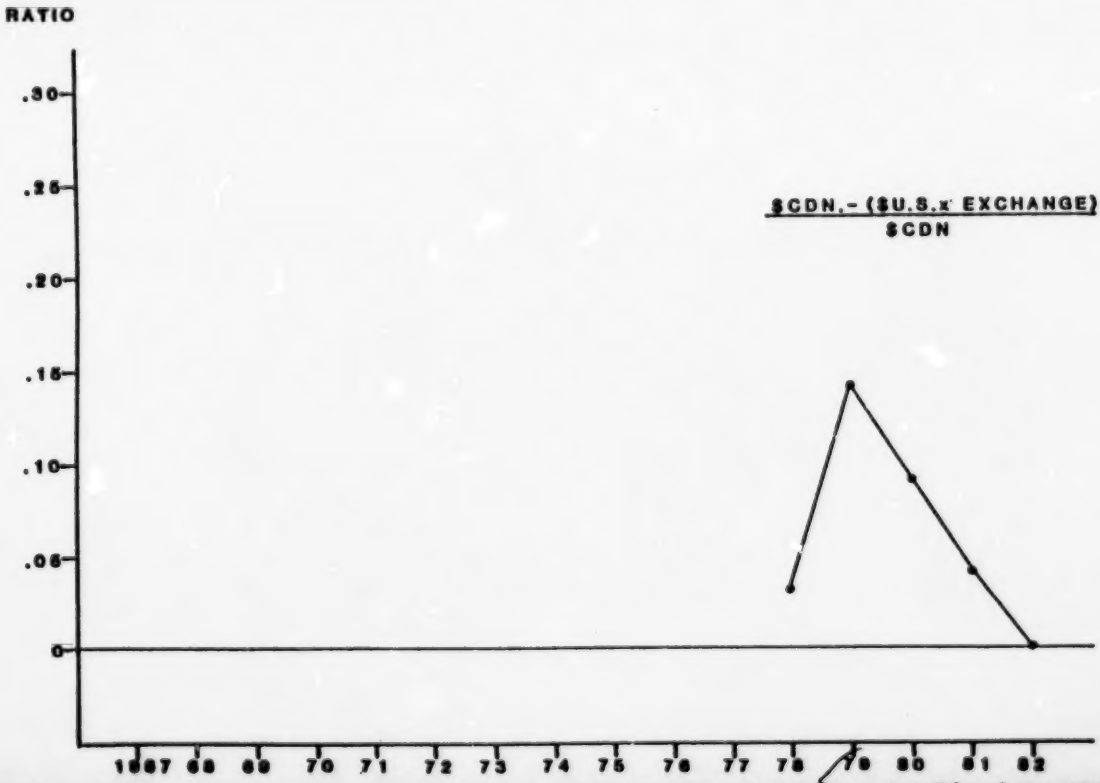
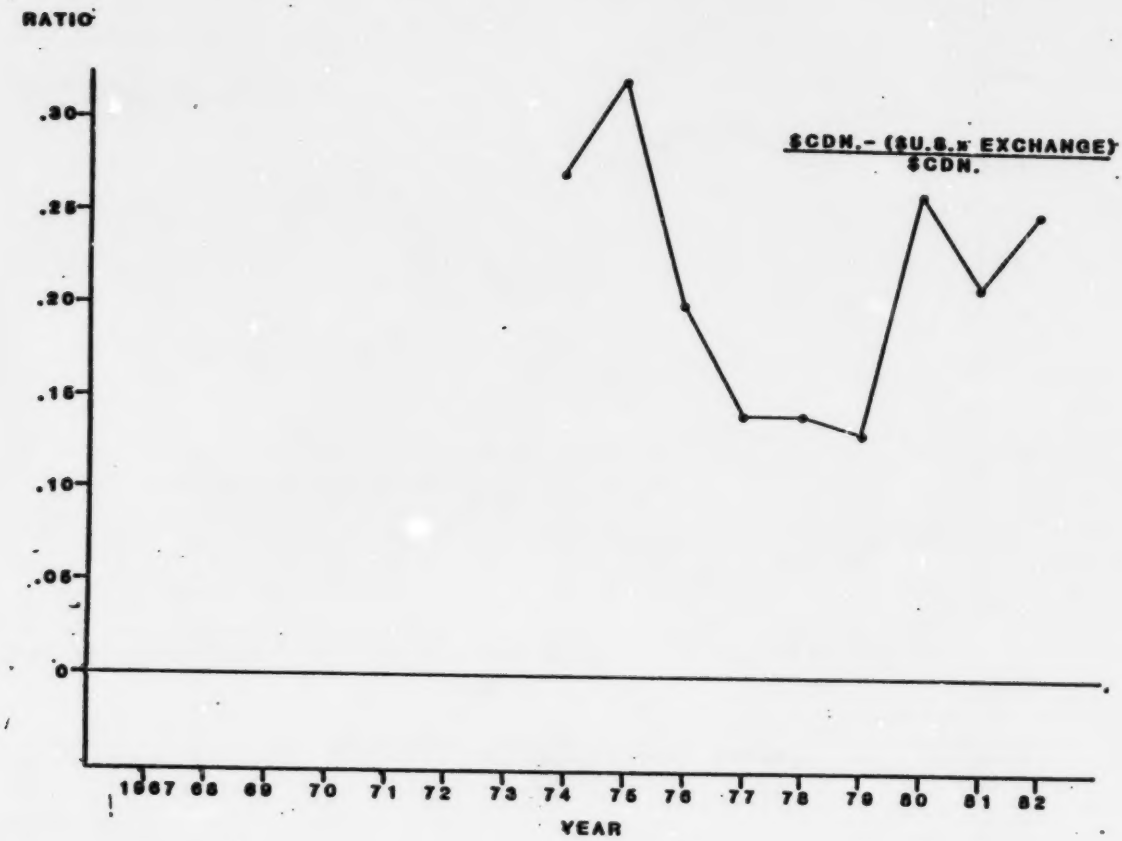


FIGURE: 15 LUXURY CAR PRICE DIFFERENCE RATIOS (AUDI)



3.4 U.S. AND JAPANESE EXCHANGE RATES

The graphs in Figures 16 and 17 illustrate the average annual exchange rate differences between the Canadian and U.S. dollars and between the Canadian dollar and the Japanese Yen. The average annual exchange rates are based on the average daily exchange rates at noon as reported by the Bank of Canada.

The graphs show the Canadian dollar equivalents of the U.S. dollar and of 1,000 Yen.

FIGURE: 16 $ U.S. EXCHANGE RATES

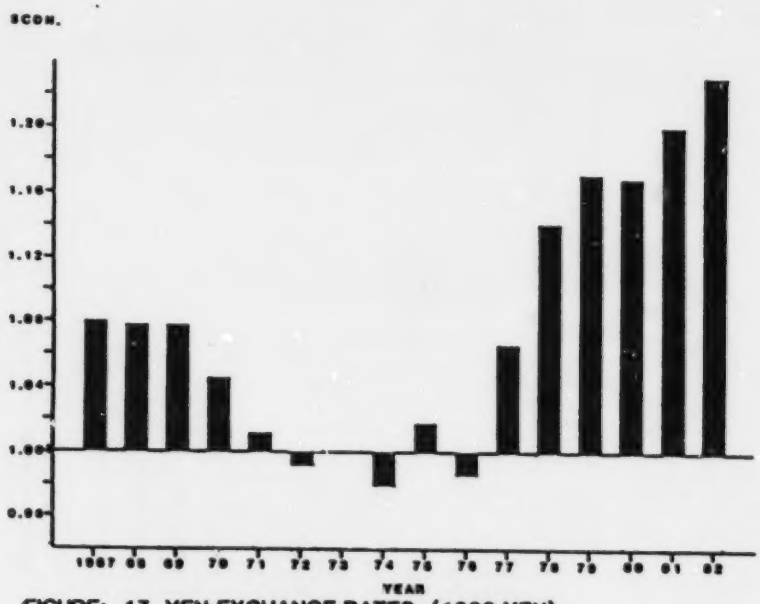
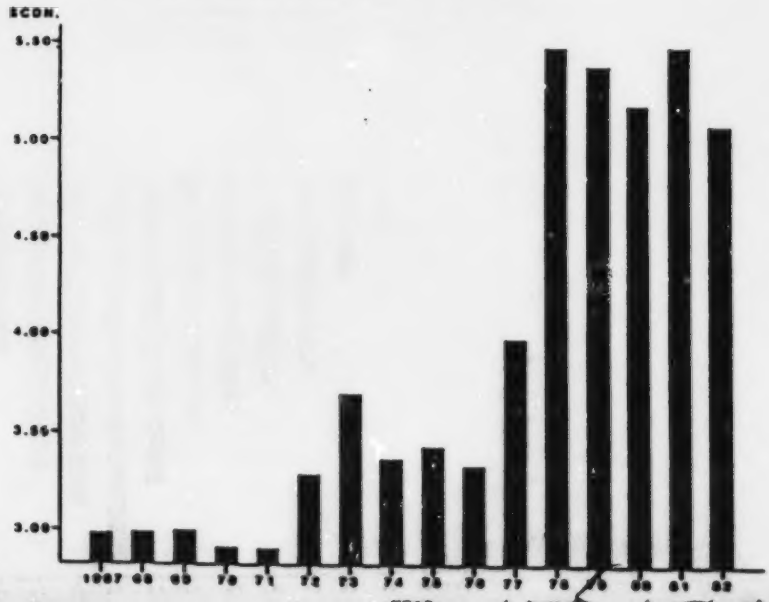


FIGURE: 17 YEN EXCHANGE RATES (1000 YEN)



3.5 MOTOR VEHICLE MANUFACTURERS PRICE INDEX

The graph in Figure 18 compares the recent annual performance of the Canadian Motor Vehicle Manufacturers Industry Selling Price Index and the U.S. Motor Vehicle Manufacturers Producer Price Index. These inflation indicators were selected specifically from the automobile (car) sector of the manufacturing industry. The last year for which this data is currently available is 1981.

The graph in Table 19 depicts the corresponding percentage difference in these price indices (e.g. Canadian index minus the U.S. index divided by the Canadian index x 100).

FIGURE: 18 COMPARISON OF MOTOR VEHICLE MANUFACTURING PRICE INDICES

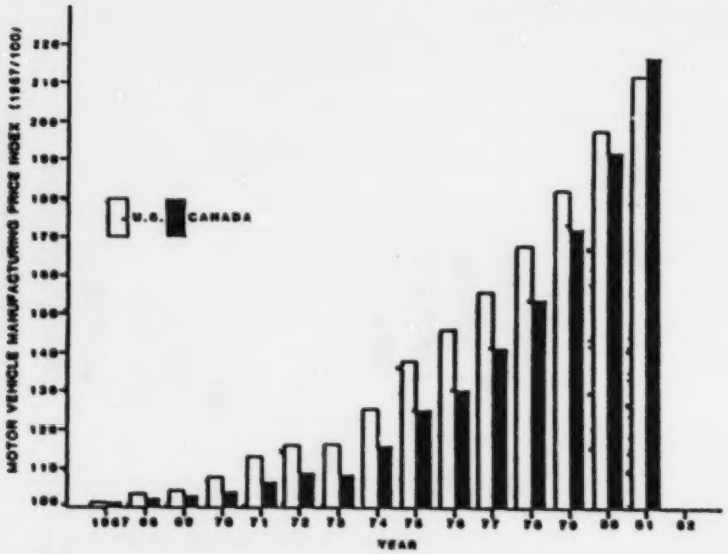
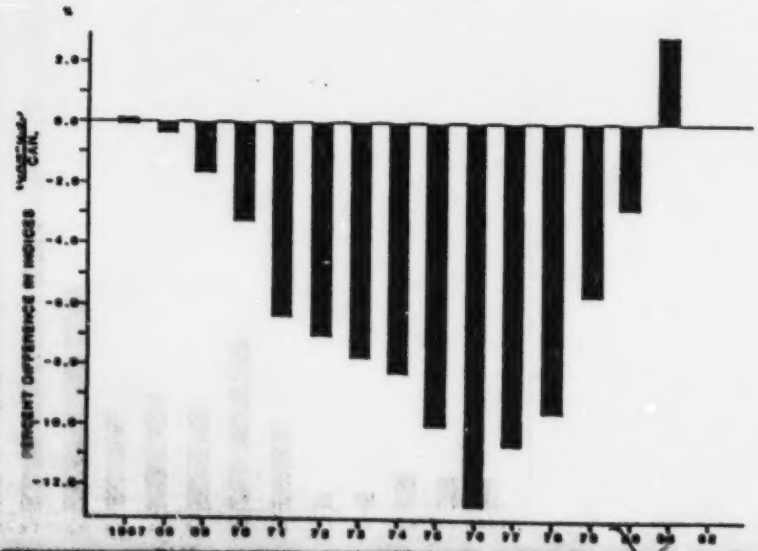


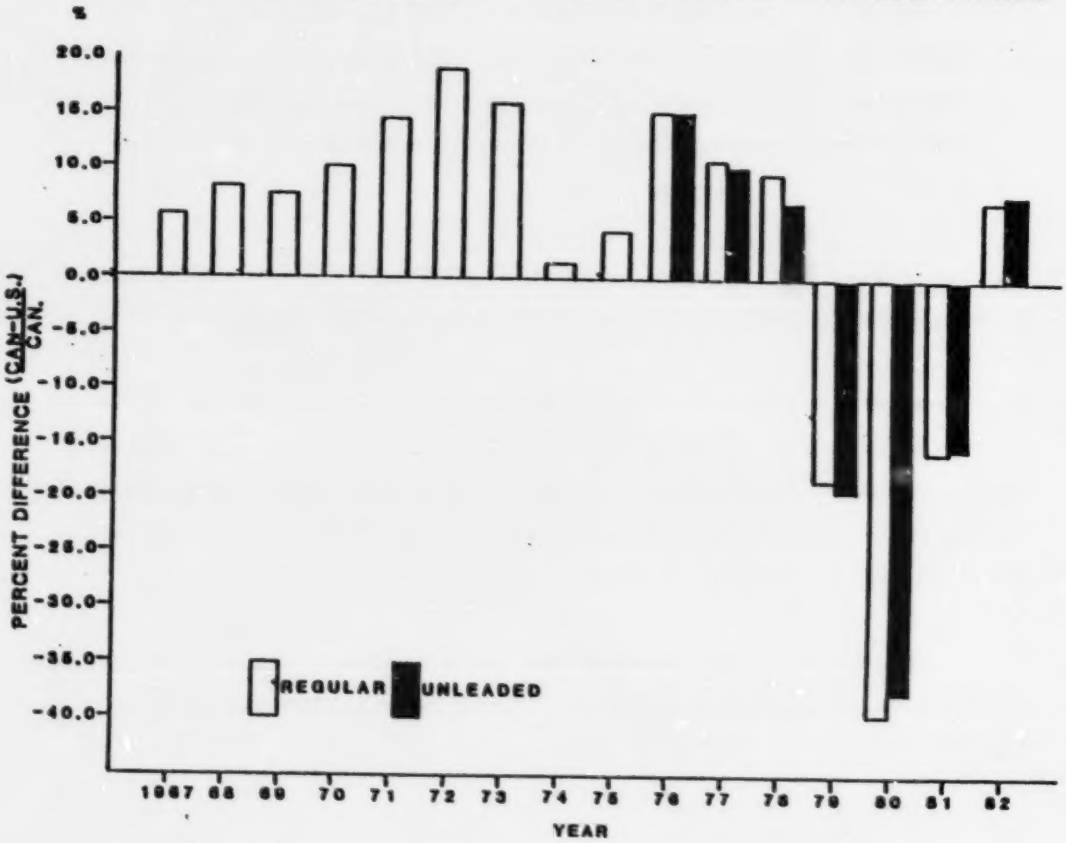
FIGURE: 19 PERCENTAGE DIFFERENCE IN MOTOR VEHICLE MANUFACTURING PRICE INDICES



3.6 RETAIL GASOLINE PRICES

The graph in Figure 20 depicts the history of the price difference ratios for regular and for unleaded retail gasoline at a full-service station in Canada and the U.S. These ratios are determined by computing the average Canadian gasoline price minus the average U.S. price (incorporating the U.S. dollar exchange rate) and then dividing by the average Canadian price.

FIGURE: 20 PERCENTAGE DIFFERENCE IN RETAIL GASOLINE PRICES



4.0 PRICE CORRELATIONS

4.1 INTRODUCTION

Tables 1,2, and 3 in the sections that follow present correlation coefficients and significance estimates for pairs of various combinations of car price difference ratios and economic indicators. The indicators for the period 1967-1982 are:

CAN/US	- U.S. exchange rates (Table A6)
CAN/YEN	- Japanese exchange rates (Table A6)
Regular	- regular gasoline price difference ratios (Table A9)
Unleaded	- unleaded gasoline price difference ratios (Table A9)
MVP Index	- automotive manufacturing price index difference ratios (Tables A7, A8)

The car prices were grouped separately for North American top sales models, certain import car models, and designated luxury car models.

The bivariate correlation coefficients were computed on the basis of the pair-wise deletion of cases with missing observations. In addition to the correlation coefficient, the entries in the tables indicate the number of cases and the corresponding significance probability value based on the Student's 't' test.

The acceptance criteria assumed for the subsequent discussions is an absolute value of 0.7 or greater for the correlation value(r) at a significance level of 96% or more.

4.2 NORTH AMERICAN CAR PRICE DIFFERENCE CORRELATIONS

4.2.1 General Observations

The comparison of non-weighted versus sales-weighted correlation coefficients in Table 1 fails to reveal any significant differences between the two calculation method. However, this effect may be due to the concentration of sales of the top selling car model, typically a Chevrolet or Pontiac, which typically had double the sales of the 10th place sales leader throughout the 1967-1982 period.

4.2.2 Effect of Exchange Rates

The Canadian to U.S. car price differences have a high negative correlation to both the U.S. and Japanese exchange rates, with 'r's in excess of 0.9.

4.2.3 Effect of Fuel Prices

Neither fuel type meets the specified correlation acceptance criteria of 0.7.

4.2.4 Effect of Manufacturing Price Index

The producer price index is not correlated to the differences between Canadian and U.S. car prices.

TABLE 1: CORRELATION COEFFICIENTS - NORTH AMERICAN CARS

PRICE DIFFERENCE RATIO	EXCHANGE RATES		FUEL PRICE DIFFERENCE		MVP INDEX
	CAN/U.S.	CAN/YEN	REGULAR	UNLEADED	
North American Average	-0.9007* (16) P=0.000	-0.9155 (16) P=0.000	0.6806 (15) P=0.003	0.6404 (6) P=0.085	-0.1134 (16) P=0.344
North American Sales-weighted Averages	-0.9020 (16) P=0.000	-0.9083 (16) P=0.000	0.6800 (15) P=0.003	0.6340 (6) P=0.088	-0.1197 (15) P=0.335

* coefficient
(no. of cases)
significance

4.3 IMPORT CAR PRICE DIFFERENCE CORRELATIONS

4.3.1 General Observations

The import car price difference correlation results in Table 2 reflect only the period 1974-1982. The average-priced import car (IMPORT AVERAGE) shows a stronger correlation with the economic parameters than any of the individual models that were used to calculate this average.

Of all the factors, only exchange rates were consistently correlated to price difference. A weak association between prices and the motor vehicle production index is also noted.

4.3.2 Effect of Exchange Rates

With the sole exception of the Honda, there appears to be a significant level of association between import car price differences and both the U.S. and Japan exchange rates. The Honda pricing policy, however, appears to be strongly influenced by the relative strengths of the Canadian and U.S. dollars, but is insensitive to the relative value of the Yen.

4.3.3 Effect of Fuel Prices

There is no significant association between the import car price difference and fuel price, as both the correlation coefficient and level of significance are below the acceptance criteria limits.

4.3.4 Effect of Manufacturing Price Index

Car price difference correlation with the producer price index is relatively strong for the average import, but relatively weak when calculated by manufacturer. The extremely low correlation of the Toyota price differences is exceptional and indicates their pricing policy is not dependent on the manufacturing index.

TABLE 2: CORRELATION COEFFICIENTS - IMPORT CARS

PRICE DIFF. RATIO BY MANUFACTURER	EXCHANGE RATES CAN/U.S.	EXCHANGE RATES CAN/YEN	FUEL PRICE DIFFERENCE REGULAR	FUEL PRICE DIFFERENCE UNLEADED	MVP INDEX
Nissan	-0.7550*	-0.7826	0.4524	0.4199	-0.7119
	(9)	(9)	(8)	(6)	(8)
	P=0.009	P=0.006	P=0.130	P=0.204	P=0.024
Honda	-0.8098	-0.5847	0.5378	0.5644	-0.6922
	(9)	(9)	(8)	(6)	(8)
	P=0.004	P=0.049	P=0.085	P=0.122	P=0.029
Toyota	-0.8592	-0.8177	0.5866	0.5778	-0.0953
	(9)	(9)	(8)	(6)	(8)
	P=0.001	P=0.004	P=0.063	P=0.115	P=0.001
Volkswagen	-0.9101	-0.8324	0.4366	0.4135	-0.6330
	(9)	(9)	(8)	(6)	(8)
	P=0.000	P=0.003	P=0.140	P=0.208	P=0.046
Renault	-0.8710	-0.7789	0.5434	0.5571	-0.7266
	(9)	(9)	(8)	(6)	(8)
	P=0.001	P=0.007	P=0.082	P=0.125	P=0.021
Fiat	-0.8875	-0.8393	0.5407	0.5477	-0.6248
	(9)	(9)	(8)	(6)	(8)
	P=0.001	P=0.002	P=0.083	P=0.130	P=0.049
Import Average	-0.9449	-0.8488	0.6006	0.5976	-0.8272
	(9)	(9)	(8)	(6)	(8)
	P=0.000	P=0.002	P=0.058	P=0.105	P=0.006

* coefficient
(no. of cases)
significance

The significance levels for the Volkswagen and the Fiat fall only within a 95% level of significance which is marginally below the acceptance criteria limit.

4.4 LUXURY CAR PRICE DIFFERENCE CORRELATIONS

4.4.1 General Observations

The luxury car price differences are only correlated to the exchange rates (Table 3). With the sole exception of the Imperial, there is no acceptable correlation with either the fuel price or the manufacturing price index.

4.4.2 Effect of Exchange Rates

The Canadian to U.S. price difference ratios for the Cadillac, Lincoln, and Imperial exhibit a very strong negative correlation with both the U.S. and Japanese exchange rates. The car price differences are most strongly correlated with the exchange rate between the Canadian dollar and the Yen for the North American luxury cars.

The Cressida and the Audi prices indicate no correlation with currency exchange rates.

4.4.3 Effect of Fuel Prices

The fuel price differences show no correlation to the price differences of luxury cars, as both the coefficient and the level of significance are below the acceptable limits.

The price differences of the Chrysler Imperial to exhibit a significant correlation to the price differences of regular gasoline. However, the interruption of production of the Imperial from 1976-1980 results in a large gap in the car price time series (Figure 12) at a time when fuel prices had large changes. For this reason, this correlation is not considered to be valid and is rejected.

TABLE 3: CORRELATION COEFFICIENTS - LUXURY CARS

PRICE DIFF. RATIO BY MANUFACTURER	EXCHANGE RATES CAN/U.S.	EXCHANGE RATES CAN/YEN	FUEL PRICE DIFFERENCE REGULAR	FUEL PRICE DIFFERENCE UNLEADED	MVP INDEX
Cadillac	-0.7767*	-0.9518	0.6700	0.6488	0.0871
	(16)	(16)	(15)	(6)	(15)
	P=0.000	P=0.000	P=0.003	P=0.082	P=0.379
Lincoln	-0.7737	-0.9401	0.5676	0.3912	0.0967
	(15)	(15)	(14)	(6)	(14)
	P=0.000	P=0.000	P=0.017	P=0.222	P=0.371
Imperial	-0.8713	-0.9326	0.8453		-0.3953
	(10)	(10)	(9)	(1)	(9)
	P=0.001	P=0.000	P=0.002		P=0.146
Cressida	-0.4149	0.1660	-0.5575	-0.5721	-0.0707
	(5)	(5)	(4)	(4)	(4)
	P=0.244	P=0.395	P=0.221	P=0.214	P=0.465
Audi	-0.2497	-0.4216	-0.1548	-0.5415	0.0768
	(9)	(9)	(8)	(6)	(8)
	P=0.259	P=0.129	P=0.357	P=0.134	P=0.428
Luxury Average	-0.8024	-0.9362	0.5079	0.2080	0.0779
	(16)	(16)	(15)	(6)	(15)
	P=0.000	P=0.000	P=0.027	P=0.346	P=0.391

* coefficient
(no. of cases)
significance

4.5 SUMMARY OF CAR PRICE DIFFERENCE CORRELATIONS

Table 4 summarizes the correlation results for the average car by group and indicates the following:

- The average North American, import and luxury car exhibits very strong negative correlation between the Canadian and the U.S. price differences and the U.S. and Japanese exchange rates;
- No relationship was identified with the price of fuel;
- Only the average import car shows a negative correlation between the price differences and the motor vehicle manufacturing price index.

TABLE 4: CORRELATION SUMMARY

VEHICLE GROUP	EXCHANGE RATES	FUEL PRICE DIFFERENCES	MVP INDEX
North American	Strongly Negative	-	-
Import	Strongly Negative	-	Negative
Luxury	Strongly Negative	-	-

5.0 CONCLUSION

The data analyzed in the foregoing chapter, reveals a clear pattern of gradual reduction in the relative price of cars in Canada with respect to the U.S. Before 1977, the cars cost on average 15% more in Canada than in the U.S. This difference applied to standard North American cars, while imports (as best defined by the truncated time series) were slightly lower (10-15%) and luxury cars higher (15-20%).

After 1977, these relationships changed dramatically until, in 1982, many of the cars have Canadian selling prices lower than their U.S. pairs. A notable exception to this trend was Audi, which maintained a 25% cost premium on the Canadian cars.

The study undertook regression analyses of the price data to several potential explanatory economic variables, including:

- exchange rates (both U.S. and Yen);
- relative U.S. price of gasoline;
- relative U.S. manufacturing price index.

Of these variables, the only parameter strongly associated with the price changes was the exchange rate. The value of the U.S. dollar and Yen were negatively correlated to price differences, indicating that as the Canadian dollar became weaker with respect to the U.S. dollar and Japanese Yen, the relative price of cars in Canada fell with respect to the U.S. prices.

The gradual decline in the relative Canadian prices, having started in 1977 when the first major Canadian dollar devaluation occurred, clearly had no relationship to the difference in emission standards. These standards were marginally more lenient in Canada up to 1975, at which

time the U.S. standards were made significantly more stringent than those in Canada. In theory, this should have resulted in lower prices in Canada - it did not. The prices remained stable (15% premium in Canada) until the devaluation in 1977.

It therefore can be concluded that:

- exchange rates cue a highly correlated with relative car price changes; and

- the changes in emission standards did not observably affect the average price differentials between Canada and the U.S.

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B. TERMS OF REFERENCE

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DATA VALUES

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Table A5: Foreign Car Sales Volumes

Table A6: U.S. and Japanese Exchange Rates

Table A7: Canadian Motor Vehicle Manufacturers Industry Selling Price Index

Table A8: U.S. Motor Vehicle Manufacturers Producer Price Index

Table A9: Retail Gasoline Prices

TABLE A1 TOP 10 NORTH AMERICAN CAR SALES MODELS PRICES, PRICE RATIOS AND WEIGHTED PRICE RATIOS

1973	CDN	US	CDN-US		1974	CDN	US	CDN-US	
1	4489	3713	0.17	4.32	.978	4506	3777	0.18	9.37
	3435	2847	0.17	3.59		3240	2768	0.16	7.07
	3707	3087	0.17	4.52		3225	2597	0.21	7.65
	4495	3710	0.17	9.26		4290	3623	0.17	6.09
	4252	3540	0.17	6.87		3383	2811	0.19	5.81
	2457	2060	0.16	4.69		3503	2927	0.18	5.67
	3280	2731	0.17	5.19		2635	2237	0.17	4.41
	2302	1968	0.15	3.63		4237	3529	0.19	4.82
	3013	2539	0.16	5.98		3069	2557	0.19	4.44
	3057	2562	0.16	4.86		4529	3855	0.17	3.85
	34487	28757	0.16	0.17		36617	30681	0.18	0.18

1975					1976					1977				
1.017	5323	4561	0.13	5.91	.986	5525	4706	0.16	7.05	1.064	5503	5021	0.03	1.[illegible]
	5045	3883	0.22	9.12		3991	3524	0.13	4.92		4149	3789	0.03	1.
	3866	3369	0.11	3.87		4266	3671	0.15	5.30		4165	3801	0.03	0.[illegible]
	4016	3415	0.14	4.33		5624	4752	0.17	5.67		5575	5049	0.04	1.
	3749	3341	0.09	2.72		3815	3371	0.13	3.86		5184	4669	0.04	1.[illegible]
	4781	4048	0.14	3.75		5022	4291	0.16	4.73		4591	4055	0.06	1.[illegible]
	5334	4625	0.12	2.60		3828	3283	0.15	3.71		4291	3944	0.02	0.[illegible]
	4258	3625	0.13	2.95		5510	4673	0.16	3.60		4094	3652	0.05	1.[illegible]
	3789	3222	0.14	2.84		4378	3813	0.14	3.11		4635	4305	0.01	0.[illegible]
	5067	4262	0.14	3.04		5534	4767	0.15	3.01		5968	5152	0.08	2.[illegible]
	45228	38351	0.14	0.14		47493	40851	0.15	0.15		48155	43437	0.04	0.[illegible]

TABLE A1 TOP 10 AMERICAN CAR SALES MODELS PRICES, PRICE RATIOS AND WEIGHTED PRICE RATIOS

1967	CDN	US	CDN-US		1968	CDN	US	CDN-US		1969	CDN	US	CDN-US	
1.079	4015	2665	0.28	9.93	1.077	4191	2797	0.28	14.62	1.077	4020	3387	0.09	4.81
	3641	2876	0.15	5.17		3451	2756	0.14	10.63		3530	2817	0.14	10.26
	3331	2639	0.15	6.68		3067	2459	0.14	3.00		3065	2485	0.13	3.55
	2956	2342	0.15	2.90		4146	3076	0.20	5.22		4203	3179	0.19	4.08
	3969	2936	0.20	4.84		3210	2544	0.15	2.64		3258	2575	0.15	2.98
	3074	2411	0.15	3.07		3304	2659	0.13	8.79		3363	2704	0.13	7.40
	3024	2520	0.10	3.43		3049	2462	0.13	3.00		3066	2487	0.13	2.78
	2963	2359	0.14	3.24		2999	2375	0.15	2.65		2802	2259	0.13	2.50
	3059	2441	0.14	2.22		3402	2699	0.15	4.37		3488	2784	0.14	3.51
	3248	2562	0.15	2.83		3360	2797	0.10	3.21		3370	2882	0.08	1.74
	33280	25751	0.16	0.16		34179	26624	0.16	0.16		34167	27559	0.13	0.13

1970	CDN	US	CDN-US		1971	CDN	US	CDN-US		1972	CDN	US	CDN-US	
1.044	3712	2948	0.17	4.96	1.01	3891	3191	0.17	5.15	.99	4328	3699	0.15	4.31
	3551	2820	0.17	7.01		3523	2916	0.16	2.95		3547	3053	0.15	3.11
	3215	2596	0.16	3.14		3883	3180	0.17	8.64		2351	2039	0.14	2.83
	3486	3003	0.10	1.61		3327	2753	0.16	3.45		4308	3671	0.16	7.66
	2977	2422	0.15	3.46		3616	2948	0.18	7.95		3360	2861	0.16	3.77
	3122	2544	0.15	6.57		2180	1810	0.16	3.07		4023	3424	0.16	6.30
	3223	2601	0.16	3.15		3155	2587	0.17	3.44		3155	2706	0.15	4.22
	2764	2231	0.16	3.78		2915	2315	0.20	4.16		2201	.960	0.12	2.72
	3606	2869	0.17	3.39		2848	2377	0.16	4.24		2848	2483	0.14	4.38
	2926	2327	0.17	3.06		3498	2895	0.16	3.28		2915	2528	0.14	3.54
	32582	26361	0.16	0.16		32836	26972	0.17	0.17		33036	28424	0.15	0.15

TABLE A1 TOP 10 NORTH AMERICAN CAR SALES MODELS PRICES, PRICE RATIOS AND WEIGHTED PRICE RATIOS

1978					1979					1980				
1.14	6253	5283	0.04	1.88	1.172	6824	5705	0.02	1.03	1.169	6444	5444	0.01	0.47
	4971	4279	0.02	0.67		5397	4498	0.02	1.00		7385	6252	0.01	0.36
	6359	5410	0.03	1.02		6939	5746	0.03	1.09		7632	6289	0.04	1.21
	4733	4020	0.03	0.92		5145	4273	0.03	0.83		5265	4438	0.01	0.42
	5602	4842	0.01	0.41		6040	5063	0.02	0.51		6129	5206	0.01	0.20
	4260	3663	0.02	0.51		4360	3794	-0.02	-0.52		7768	6397	0.04	1.01
	4380	3632	0.05	1.24		5941	4993	0.02	0.39		6663	5728	00.00	-0.12
	4547	3865	0.03	0.74		6817	6158	-0.06	-1.47		6164	5122	0.03	0.66
	6255	5411	0.01	0.32		7021	6200	-0.03	-0.84		6672	5669	0.01	0.15
	4971	4342	0.00	0.09		4667	3870	0.03	0.65		5878	4691	0.07	1.41
	52331	44767	0.03	0.03		59151	50300	0.00	0.01		66000	55236	0.02	0.02

1981					1982				
1.199	8801	7484	-0.02	-0.69	1.217	10251	8588	-0.02	-0.68
	5966	5154	-0.04	-1.18		9742	8136	-0.02	-0.51
	8190	6698	0.02	0.60		8022	6754	-0.02	-0.81
	7526	5980	0.05	1.14		7234	6629	-0.12	-2.53
	7526	5980	0.05	1.04		7234	6629	-0.12	-2.77
	5990	5158	-0.03	-0.71		9674	7918	0.00	0.08
	8723	7153	0.02	0.35		10420	8890	-0.04	-0.77
	8660	7241	00.00	-0.05		6865	6046	-0.07	-1.58
	8885	7471	-0.01	-0.16		6316	5512	-0.06	-2.05
	7327	6307	-0.03	-0.64		11490	9658	-0.02	-0.48
	77594	64626	0.00	00.00		87248	74760	-0.05	-0.05

LEGEND

CDN entries are in canadian dollars, US entr are in US dollars, for the respective car mo listed in Table A4.

CDN-US is the ratio $\frac{\text{CDN-US x exchange}}{\text{CDN}}$

The last column is the corresponding intermediate weighted ratio, and weighted average

TABLE A2 FOREIGN CAR MODELS PRICES AND PRICE RATIOS

1973	CDN	US	CDN-US
1			

1974	CDN	US	CDN-US
.978	2745	2455	0.13
	2995	2395	0.22
	2798	2549	0.11
	2995	2625	0.14
	2998	2790	0.09
	2849	2465	0.15
	17380	15279	0.14

1975			
1.017	3295	2849	0.12
	3395	2798	0.16
	3348	2711	0.18
	3350	2895	0.12
	4095	3295	0.18
	3245	2741	0.14
	20728	17289	0.15

1976			
.986	3670	3084	0.17
	3159	2729	0.15
	3588	2849	0.22
	4145	3499	0.17
	4085	3295	0.20
	3895	2998	0.24
	22542	18454	0.19

1977			
1.064	3295	2989	0.03
	3232	2799	0.08
	3338	2788	0.11
	4445	4079	0.02
	5165	4450	0.08
	5495	4431	0.14
	24970	21536	0.08

TABLE A2 FOREIGN CAR MODELS PRICES AND PRICE RATIOS

1978			
1.14	3845	3258	0.03
	4295	3115	0.17
	4878	3963	0.07
	5275	4509	0.03
	4695	3995	0.03
	5670	4698	0.06
	28658	23538	0.07

1979			
1.172	4990	3899	0.08
	4635	3649	0.09
	5583	4563	0.04
	5875	5097	-0.02
	5425	4445	0.04
	6895	5590	0.05
	33463	27243	0.05

1980			
1.169	4690	3899	0.03
	4695	3699	0.08
	5898	4758	0.06
	6845	5475	0.06
	5995	4869	0.05
	9695	7458	0.10
	37818	30158	0.06

1981			
1.199	5181	4449	-0.03
	5145	4199	0.02
	5478	4978	-0.09
	7345	6310	-0.03
	6695	5600	00.00
	10545	8190	0.07
	40389	33726	-0.01

1982			
1.217	5732	4449	0.06
	5695	4799	-0.03
	5998	4998	-0.01
	7895	6820	-0.05
	5595	4995	-0.09
	13495	10990	0.01
	44410	37051	-0.02

LEGEND

CDN entries are in canadian dollars, U entries are in US dollars, for the respective car models listed in Table A5.

CDN-US is the ratio $\frac{\text{CDN-US x exchange}}{\text{CDN}}$

TABLE A3 LUXURY CAR MODEL PRICES AND PRICE DIFFERENCE RATIOS

1967	CDN	US	CDN-US
1.079	8677	6290	0.22
	7373	5413	0.21
	16050	11703	0.21

1968	CDN	US	CDN-US
1.077	8757	6440	0.21
	7458	5580	0.19
	8837	6490	0.21
	25052	18510	0.20

1969	CDN	US	CDN-US
1.077	8925	6641	0.20
	7734	5730	0.20
	16659	12371	0.20

1970	CDN	US	CDN-US
1.044	9138	6806	0.22
	7675	5808	0.21
	7966	5917	0.22
	24779	18531	0.22

1971	CDN	US	CDN-US
1.01	9368	7315	0.21
	8520	6761	0.20
	7639	5864	0.22
	25527	19940	0.21

1972	CDN	US	CDN-US
.99	9347	7621	0.19
	8816	7212	0.19
	8399	6762	0.20
	26562	21595	0.20

TABLE A3 LUXURY CAR MODEL PRICES AND PRICE DIFFERENCE RATIOS

1973	CDN	US	CDN-US
1	9491	7637	0.20
	8966	7322	0.18
	8703	6897	0.21
	27160	21856	0.20

1974	CDN	US	CDN-US
.978	9777	7896	0.21
	9288	7637	0.20
	8955	7192	0.21
	6620	4975	0.27
	34640	27700	0.22

1975			
1.017	12449	10427	0.15
	11257	9656	0.13
	10544	8844	0.15
	8495	5695	0.32
	42745	34622	0.19

1976			
.986	13049	10935	0.17
	11078	9293	0.17
	8700	7100	0.20
	32827	27328	0.18

1977			
1.064	13480	11546	0.09
	11528	9636	0.11
	8800	7150	0.14
	33808	28332	0.11

TABLE A3 LUXURY CAR MODEL PRICES AND PRICE DIFFERENCE RATIOS

1978			
1.14	14379	12292	0.03
	12123	10166	0.04
	8208	6989	0.03
	7970	6045	0.14
	42680	35492	0.06

1979			
1.172	16272	13446	0.03
	13842	11200	0.05
	11248	8279	0.14
	8490	6295	0.13
	49852	39220	0.09

1980			
1.169	18046	14927	0.03
	16524	12884	0.09
	11848	9199	0.09
	13995	8870	0.26
	60413	45880	0.12

1981			
1.199	21071	16355	0.07
	18589	14068	0.09
	23554	18311	0.07
	13498	10779	0.04
	14045	9210	0.21
	90757	68723	0.10

1982			
1.217	24206	18567	0.07
	28176	21302	0.08
	26936	20988	0.05
	14948	12249	0.00
	17745	10865	0.25
	112011	83971	0.09

LEGEND

CDN entries are in canadian dollars, US entries are in US dollars, for the following models Cadillac, Lincoln, Imperial, Cressida, Audi respectively.

CDN-US is the ratio $\frac{\text{CDN-US x exchange}}{\text{CDN}}$

TABLE A4-1: TOP 10 NORTH AMERICAN CAR MODELS
(SOURCE: R.L. POLK & CO. LTD.)

1967		1968		1969		1970	
Pontiac	35235	Pontiac	52426	Pontiac	51973	Pontiac	29423
Chevrolet	45864	Chevrolet	76362	Chevrolet	72843	Chevrolet	40617
Chevelle	19579	Chevelle	22330	Chevelle	27870	Chevelle	20075
Chrysler	23891	Chrysler	25733	Chrysler	21736	Dodge	15977
Mustang	20418	Mustang	17636	Maverick	19573	Maverick/ Falcon	23447
Ford	33929	Ford	66448	Ford	55135	Ford	44258
Fairlane	23019	Fairlane	22725	Fairlane	22069	Torino	20053
Buick	16405	Buick	18175	Dart	19104	Valiant	24045
Pol/440	18519	Plymouth	29611	Plymouth	25375	Plymouth	20150
Impala/Caprice	35096	Dodge	30505	Dodge	22247	Dart	17971

1971		1972		1973	
Pontiac	30285	Pontiac	27853	Pontiac	24735
Cutlas	18477	Cutlass	21320	Lemans	20717
Chevrolet	50272	Vega	20001	Cutlass	26972
Chevelle	21453	Chevrolet	49183	Chevrolet	53225
Ford	45209	Chevelle	24087	Ford	41333
Pinto	18791	Ford	40302	Vega	29342
Torino	20355	Torino	28120	Torino	30804
Dart	21215	Pinto	22556	Pinto	25270
Valiant	27394	Valiant	31797	Valiant	38165
Plymouth	19575	Dart	24792	Dart	29583

TABLE A4-2: TOP 10 NORTH AMERICAN CAR MODELS
(SOURCE: R.L. POLK & CO. LTD.)

1974		1975		1976		1977	
Chevrolet	51,547	Chevrolet	46,482	Chevrolet	43,620	Chevrolet	52,204
Valiant	43,291	Ford	41,615	Volare	37,473	Volare	40,217
Dart	35,930	Valiant	33,842	Chevelle	34,739	Aspen	34,025
Ford	34,826	Chevelle	32,295	Ford	33,932	Pontiac	31,256
Torino	31,189	Dart	28,719	Aspen	30,386	Cutlass/Supreme	31,029
Chevelle	30,785	Cutlass	26,593	Cutlass	29,562	Chevelle/Malibu	30,636
Vega	25,566	Pontiac	22,242	Nova	24,334	Fury/Monaco	28,590
Cutlass	25,566	LeMans	21,651	Monte Carlo	21,755	Nova	27,609
Nova	23,692	Nova	21,484	LeMans	21,553	Granada	26,180
Pontiac	22,537	Monte Carlo	21,035	Pontiac	20,221	Ford	25,778

1978		1979		1980		1981	
Chevrolet	50,871	Chevrolet	51,066	Malibu	37,662	Supreme	35,014
Chevelle/Malibu	36,205	Malibu	42,706	Cutlass/Supreme	34,648	Chevette	32,505
Pontiac	33,521	Pontiac	36,666	Chevrolet	32,690	Malibu	30,665
Volare	29,413	Cutlass/Supreme	31,029	Chevettet	29,209	Reliant	24,224
Cutlass/Supreme	28,448	Chevette	29,093	Citation	28,539	Aries	21,872
Fairmont/Maverick	26,032	LeMans	26,353	Pontiac	27,370	Escort	21,561
Nova	25,121	Ford	25,722	LeMans	24,509	LeMans	20,516
Aspen	23,937	Volare	24,642	Mustang	22,989	Chevrolet	20,127
Thunderbird	22,558	Thunderbird	23,975	Camaro	22,803	Pontiac	20,000
Granada	21,974	Fairmont	23,090	Fairmont	21,309	Acadian	19,971

TABLE A5: FOREIGN CAR SALES VOLUMES

(SOURCE: R.L. POLK & CO. LTD.)

1974		1975		1976	
Toyota	37,372	Toyota	25,254	Honda	29,201
Datsun	31,424	Datsun	21,078	Toyota	27,050
Volkswagen	20,082	Volkswagen	14,208	Volkswagen	19,378
Volvo	11,261	Honda	13,838	Renault	5,520
Fiat	8,813	Volvo	6,545	Volvo	5,507
Renault	4,320	Renault	2,962	Fiat	2,343

1977		1978		1979	
Honda	47,151	Honda	45,352	Honda	33,530
Toyota	32,279	Toyota	27,165	Volkswagen	24,950
Datsun	24,954	Volkswagen	25,125	Datsun	20,529
Volkswagen	22,528	Datsun	22,900	Toyota	19,198
Renault	5,322	Renault	5,485	Renault	11,254
Volvo	4,908	Volvo	5,324	Volvo	6,996
Fiat	1,933	Fiat	3,085	Fiat	3,553

1980		1981	
Honda	44,145	Toyota	57,475
Toyota	37,659	Honda	56,640
Datsun	24,222	Datsun	29,521
Volkswagen	21,837	Volkswagen	19,310
Volvo	8,194	Renault	7,047
Renault	8,159	Volvo	6,978
Fiat	1,922	Fiat	1,001

APPENDIX B

TERMS OF REFERENCE

TERMS OF REFERENCE

(as stated in Appendix 'A', RFP)

The consultant will:

1. Plot a graph showing the Canadian price minus the U.S.A. price divided by the Canadian price in each year from 1967 to 1982 inclusive of the 10 automobile models assembled in North America which have the highest volume of sales in Canada regardless of manufacturer. Make a similar plot using the sales weighted average of the above automobiles.

2. Plot a graph showing the Canadian price minus the U.S.A. price divided by the Canadian price in each year from 1967 to 1982 inclusive of the automobile model of Nissan, Honda, Toyota, Volkswagen, Renault, and Fiat having the highest Canadian sales volume. (Six graphs are required, one for each model).

3. Plot a graph showing the Canadian price minus the U.S.A. price divided by the Canadian price in each year from 1967 to 1982 of a model of Cadillac, Lincoln, Imperial, Cressida, Audi.

4. Plot a graph showing the exchange rate between U.S.A. and Canadian dollars in Canadian funds for the years 1967 to 1982.

5. Plot a graph showing the Canadian manufacturing price index minus the U.S.A. manufacturing price index divided by the Canadian manufacturing price for the years 1967 to 1982.

6. Plot a graph showing the Canadian price of gasoline minus the U.S.A. price of gasoline divided by the Canadian price of gasoline for years 1967 to 1982. Prices are to be at the pump including taxes. Prices in Ontario and Michigan would suffice as substitutes for national averages.

7. Calculate correlation co-efficients between graphs in item 1, and graphs in terms 4, 5 and 6, and express an opinion on the significance at the 96 percentile.

8. Calculate correlation co-efficients between graphs in item 2 and graphs in items 4, 5 and 6, and express an opinion on the significance at the 96 percentile.

9. Calculate correlation co-efficients between graphs in item 3 and graphs in items 4, 5 and 6, and express an opinion on the significance at the 96 percentile.

10. Prepare a report in accordance with Environment Canada's standards explaining the above information.